

CLAIMS

- 1 1. A device for manipulating microwave radiation,
2 comprising:
3 a substrate that defines the shape of a surface for
4 reflecting microwave radiation; and
5 a metal fitting conforming to the defined shape, and
6 providing the surface that reflects microwave
7 radiation.
- 1 2. The device of claim 1 wherein the surface defines at
2 least a portion of a microwave resonant cavity.
- 1 3. The device of claim 1, wherein the metal fitting has a
2 thickness of greater than 10 μm .
- 1 4. The device of claim 1 wherein the surface defines at
2 least a portion of a microwave reflector.
- 1 5. The device of claim 1 wherein the substrate comprises an
2 insulator.
- 1 6. The device of claim 1 wherein the thickness of the metal
2 fitting is less than 500 μm .
- 1 7. The device of claim 5 wherein the thickness of the metal
2 fitting is less than 100 μm .
- 1 8. The device of claim 1 wherein the substrate has a
2 coefficient of thermal expansion less than $5 \times 10^{-6}/^{\circ}\text{C}$.
- 1 9. The device of claim 1 wherein the metal fitting has a
2 coefficient of thermal expansion greater than
3 $10 \times 10^{-6}/^{\circ}\text{C}$.
- 1 10. The device of claim 1 further comprising a braze joint
2 that bonds the metal fitting to the substrate.
- 1 11. The device of claim 1 wherein the metal fitting
2 comprises silver.
- 1 12. The device of claim 1 wherein the metal fitting

2 comprises a wrought metal.

1 13. The device of claim 1 wherein the metal fitting
2 consists of a metal that is at least 99% pure.

1 14. The device of claim 1 wherein the metal fitting is
2 bonded to the substrate via an interference fit.

1 15. The device of claim 1 wherein the metal fitting has a
2 machined surface.

1 16. The device of claim 1 wherein the metal fitting
2 completely shields the substrate from exposure to the
3 microwave radiation.

1 17. The device of claim 1 further comprising an adhesive
2 layer between the substrate and the metal fitting.

1 18. The device of claim 17, wherein the adhesive layer has
2 a thickness of less than 1.0 μm .

1 19. The device of claim 1, wherein the metal fitting has a
2 ring shape having an inner diameter and an outer
3 diameter.

1 20. The device of claim 19, wherein the inner diameter is
2 machined to match an outer diameter of the substrate.

1 21. The device of claim 19, wherein the outer diameter is
2 machined to match an inner diameter of the substrate.

1 22. The device of claim 1, wherein the substrate and the
2 metal fitting have a compatible thermal behavior.

1 23. A method for making a device for manipulating microwave
2 radiation, comprising:

3 providing a substrate that defines a shape of a surface
4 for reflecting microwave radiation;

5 providing a metal fitting having a sufficient thickness
6 to provide mechanical stability; and

7 bonding the metal fitting to the substrate, the metal
8 fitting providing the surface that reflects microwave
9 radiation.

1 24. The method of claim 23, further comprising thinning the
2 metal fitting to provide the surface after bonding the
3 metal fitting.

1 25. The method of claim 24, wherein thinning the metal
2 fitting comprises machining the metal fitting.

1 26. The method of claim 23, wherein providing the metal
2 fitting comprises machining the metal fitting prior to
3 bonding the metal fitting to the substrate.

1 27. The method of claim 23 wherein the metal fitting has a
2 thickness of greater than 500µm.

1 28. The method of claim 23, wherein providing the metal
2 fitting comprises casting and deforming the metal
3 fitting.

1 29. The method of claim 23, wherein bonding comprises:
2 providing a brazing layer between the metal fitting and
3 the substrate; and heating the brazing layer to a brazing
4 temperature.

1 30. The method of claim 23, wherein bonding comprises
2 providing an epoxy layer between the substrate and the
3 metal fitting.

1 31. The method of claim 23, wherein bonding comprises
2 providing a compression fit.

1 32. The method of claim 31, wherein bonding further
2 comprises: cooling the metal fitting; placing the metal
3 fitting adjacent to the substrate; and causing the metal
4 fitting to warm to an original temperature.

1 33. The method of claim 31, wherein bonding further

2 comprises: heating the substrate; placing the metal
3 fitting adjacent to the substrate; and causing the metal
4 fitting to cool to an original temperature.

1 34. The method of claim 23, wherein bonding comprises:
2 packing an elastomer against the metal fitting; and
3 applying a pressure to the elastomer to cause the metal
4 fitting to deform.

1 35. The method of claim 34, wherein bonding further
2 comprises disposing an adhesive layer between the metal
3 fitting and the substrate, the adhesive layer having a
4 thickness of less than 1.0 μm after applying the pressure
5 to the elastomer.

1 36. The method of claim 23 wherein the metal fitting has a
2 circular shape having an inner diameter that matches an
3 outer diameter of the substrate to a radial tolerance
4 sufficient to provide a stable fit between the metal
5 fitting and the substrate.

1 37. The method of claim 36 wherein bonding comprises
2 providing friction between the metal fitting and the
3 substrate to assist the stable fit.

1 38. The method of claim 36 wherein bonding comprises
2 providing an adhesive between the metal fitting and the
3 substrate to assist the stable fit.

1 39. The method of claim 23 wherein the substrate comprises
2 an insulator.